Using *C. elegans* for an Independent Inquiry Lab

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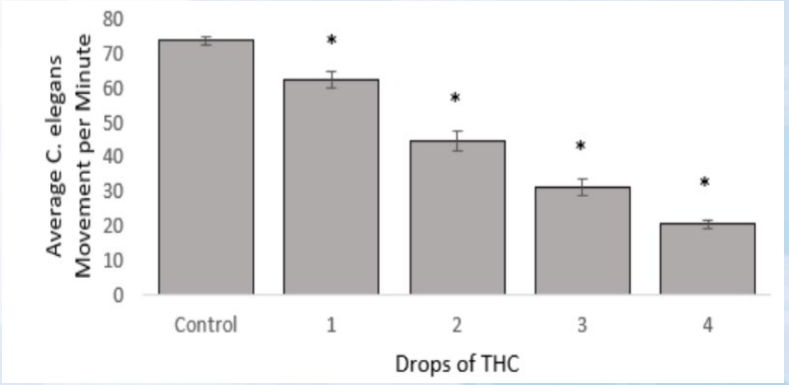


Lab Learning Goals

Poll 4

- Gain experience in research design
- Enhance reading and analysis of primary literature
- Provide technical experience with a model organism

Class

- 16-20 students
- Sophomores-seniors
  - Introductory Biology and Chemistry

Lab Learning Objectives

- Gain experience in experimental design
- Demonstrate proficiency in interpreting and analysis of data
- Demonstrate gains in scientific communication, information literacy, and formative failure

Flow Chart

Activities

- *C. elegans*
- Journal Clubs
- Lecture
- Guest Lectures

Skills

- How to search the literature
- How to read 1° and 2° literature
- Experimental Design
- Data analysis
- Critical thinking
- *C. elegans* model
- Formative failure

Independent Project

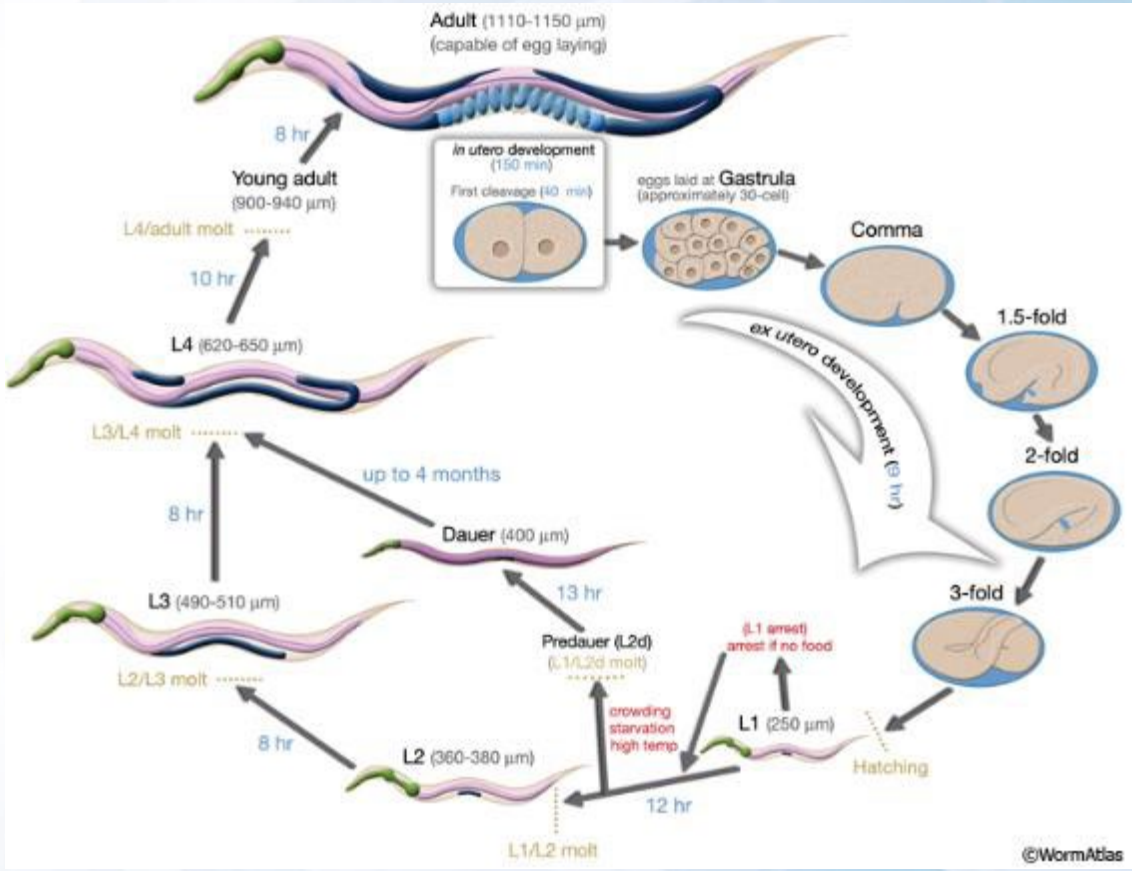
- Read & Analyze 1° and 2° literature
- Generate a hypothesis
- Design experiments
- Predict & Analyze results
- Redesign

Experiments

- *C. elegans*
  - Basic Handling
  - Dose Response (i.e., brood size, locomotion)
  - Chemotaxis assay
  - Reproductive assay

C. elegans

- Minimal training for instructor
- Cheap and easy to maintain
- Stereotypical behavioral and morphological characteristics
- Amenable to toxicological manipulations



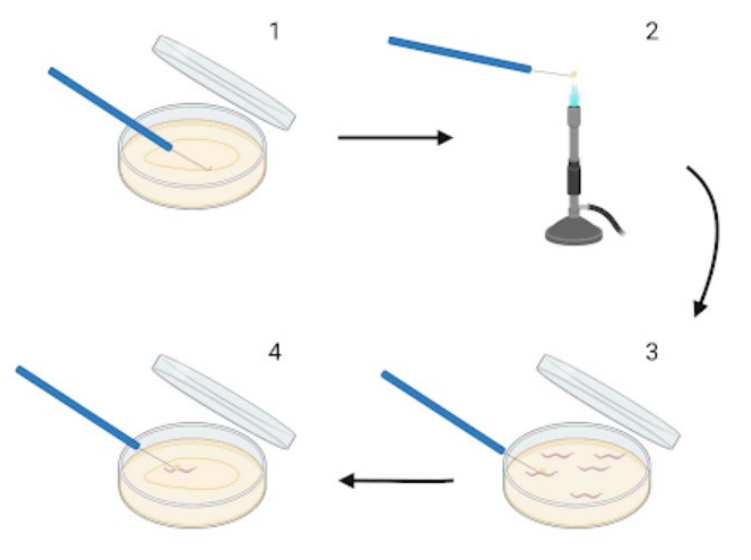
https://www.wormatlas.org/hermaphrodite/introduction/mainframe.htm

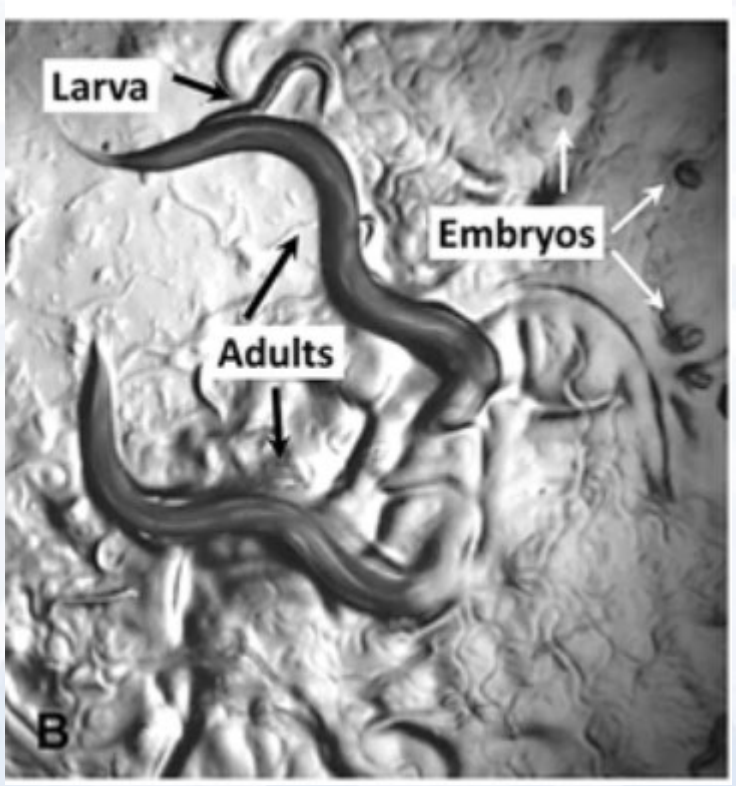
Equipment

- Stereo dissecting microscope
- Alcohol lamp
- Incubator (20°C and 15°C)
  - Room temperature works too!
- Ability to culture bacteria

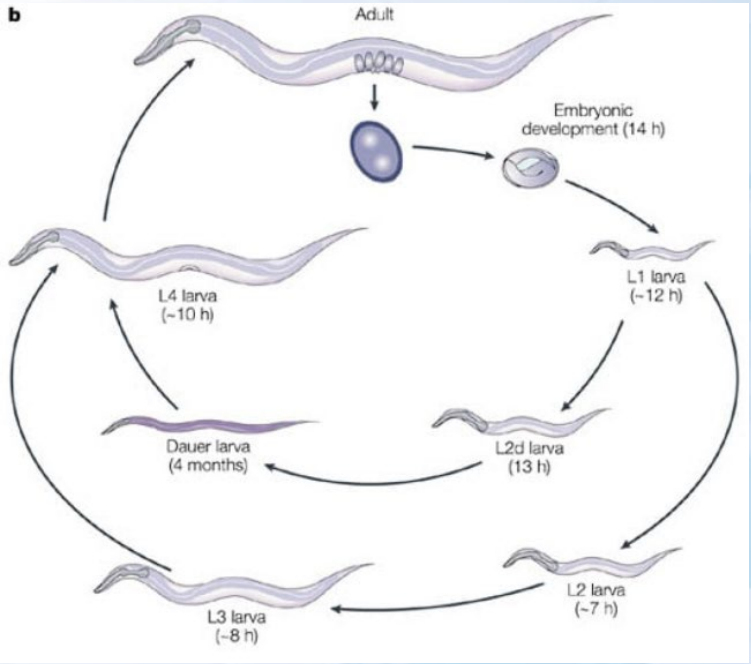
Familiarity with Model and Worm Handling (~1 wk)

- Read and discuss paper on *C. elegans* as a model
- Become familiar with worm culturing
  - Identifying
  - Picking





https://sites.wustl.edu/nonetlab/c-elegans/



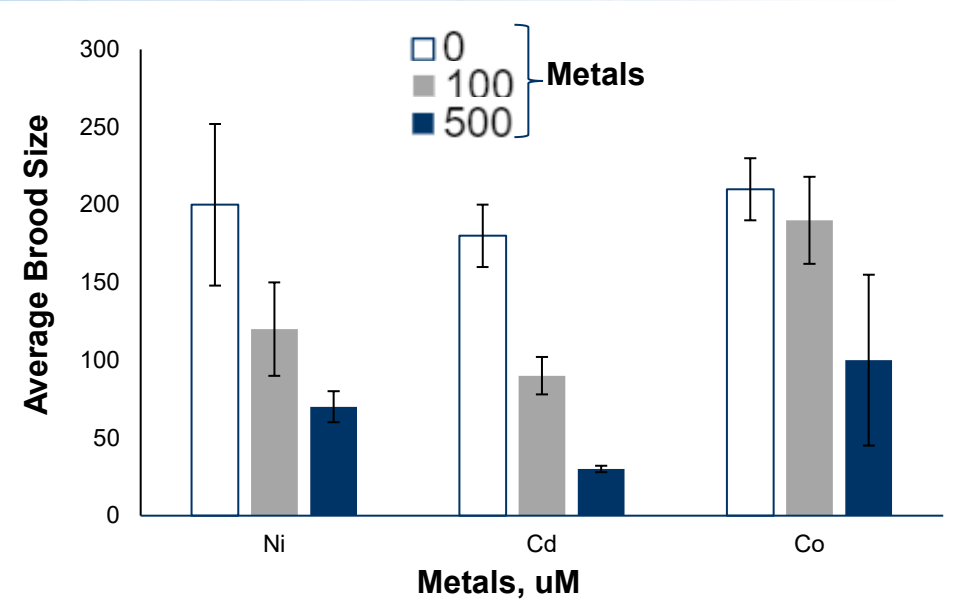
https://sites.wustl.edu/nonetlab/c-elegans/

Dose-Response, Chemotaxis, Brood Size (~2-3 wks)

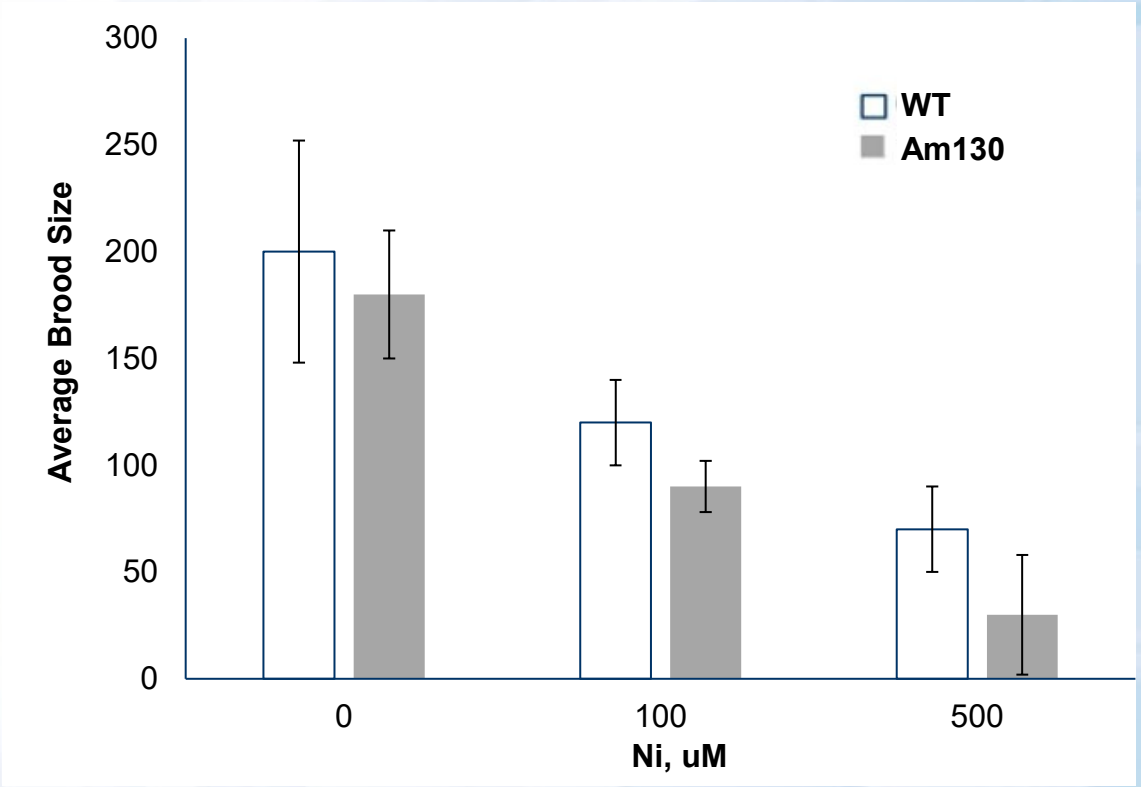
- Read relevant primary literature each week.
- Instructor designed and student designed
  - Data analysis
  - Present and explain results to the class

Possible Assays (Dose-Response and Brood Size)

- Number of progeny
  - Fertility
    - Dose or mutant



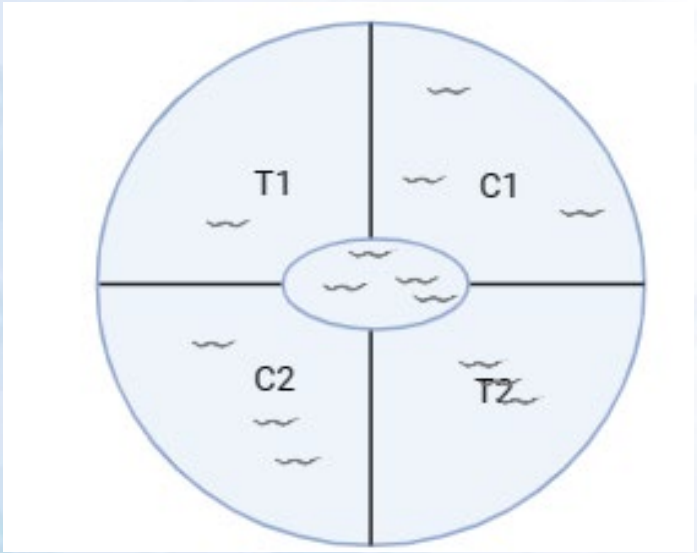
WT strain is more sensitive to Cd.

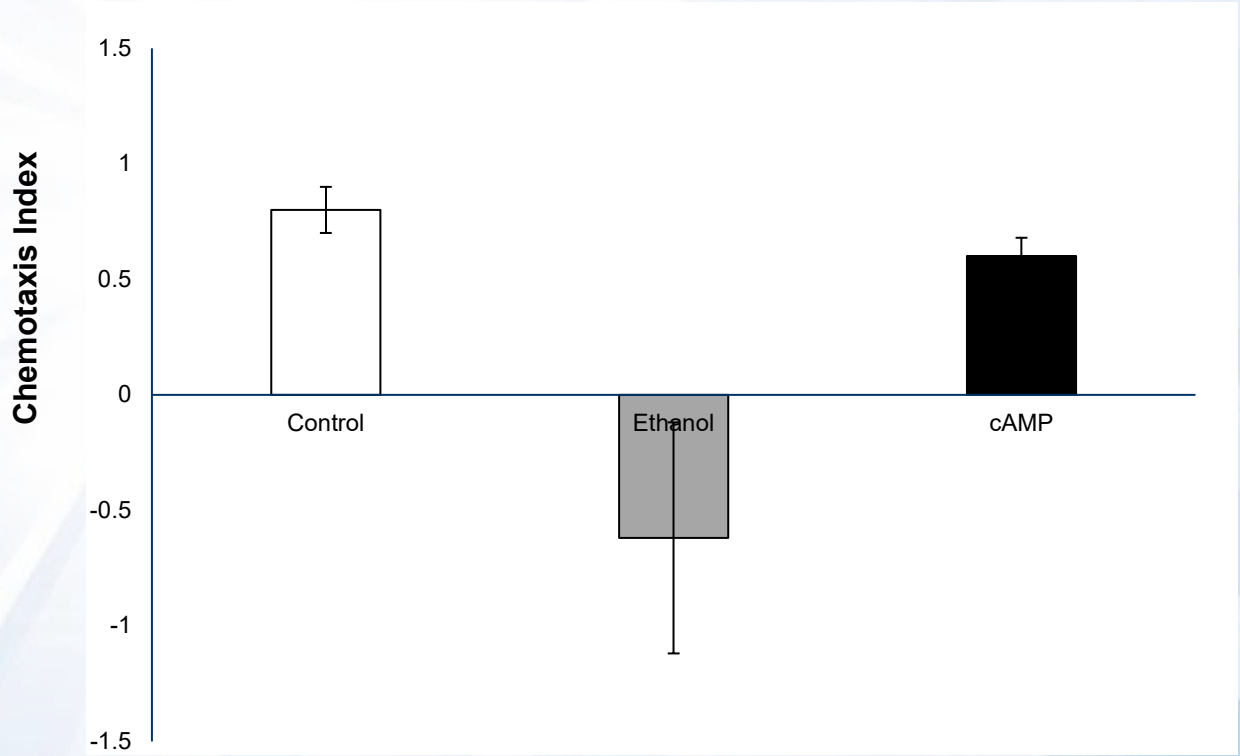


Am130 mutant stain has reduced brood size.

Possible Assays (Chemotaxis)

- Chemical or Dose





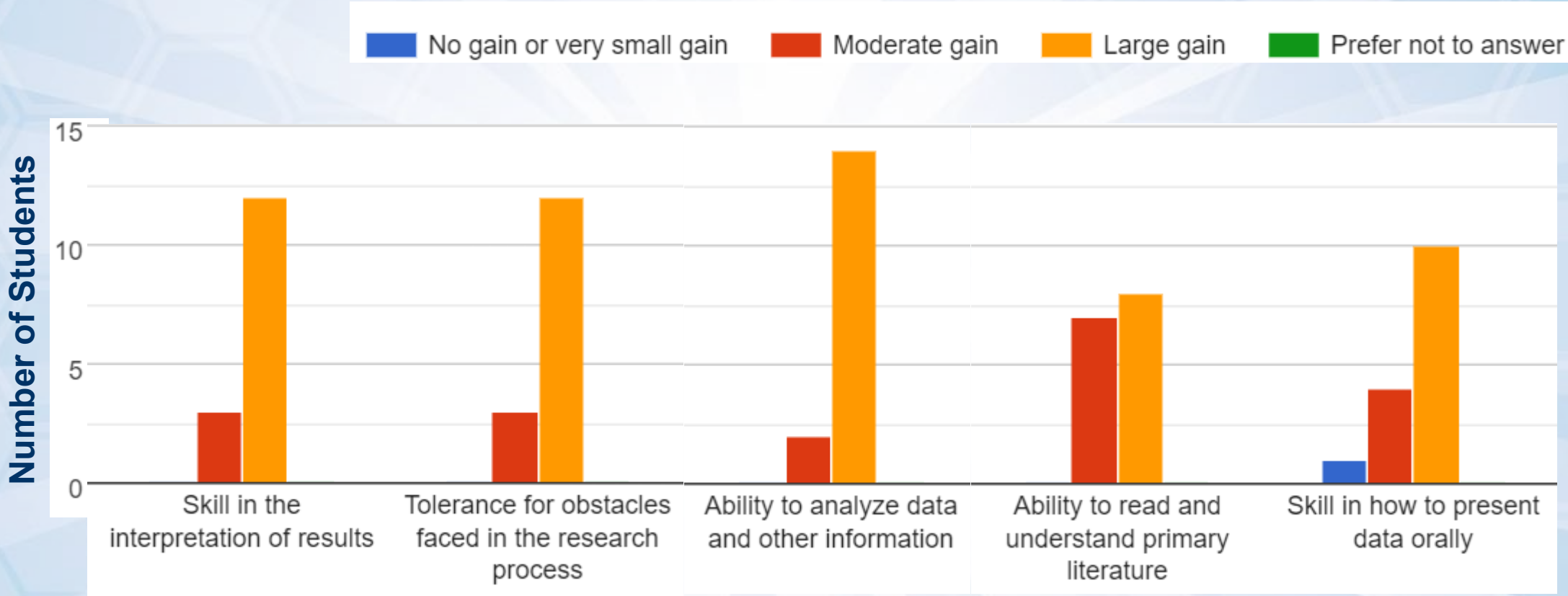
Design an Independent Experiment (~2 Weeks)

- Develop an assay to measure an effect on worm biology
  - WT, Mutant, dose
  - Write a proposal supported by literature
- Perform assay
- Analyze and present results
  - Formative failure

Repeat Independent Experiment (~2 Weeks)

- Adjust based on previous results
- Perform assay
- Analyze results
- Write an abstract and present results

Student Survey Results



Student Survey Results

Overall Conclusions

- *C. elegans* are an easy and cost-effective model for undergraduates
- Students become more comfortable with searching and analyzing the literature
- Lab introduces research methods and concepts in toxicology
- Students present their work in written and oral form

References

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